

DELL PRECISION™ T1650



Technical
Guidebook

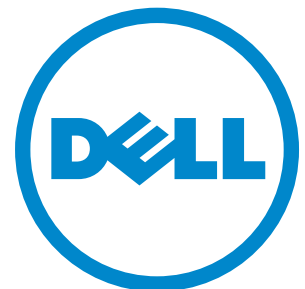
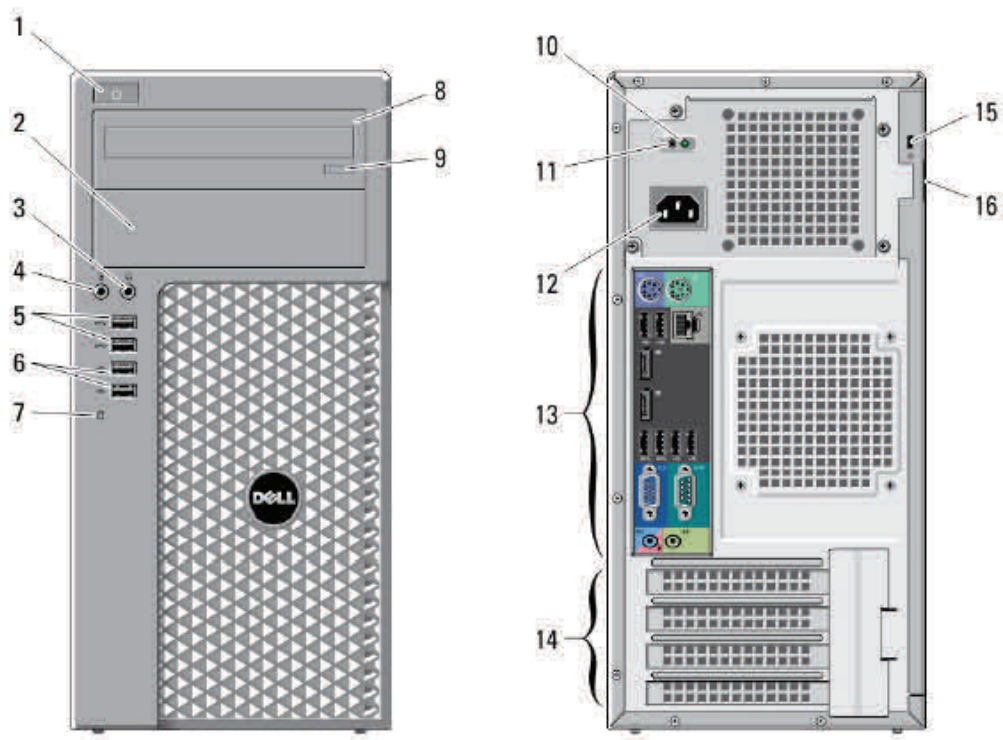


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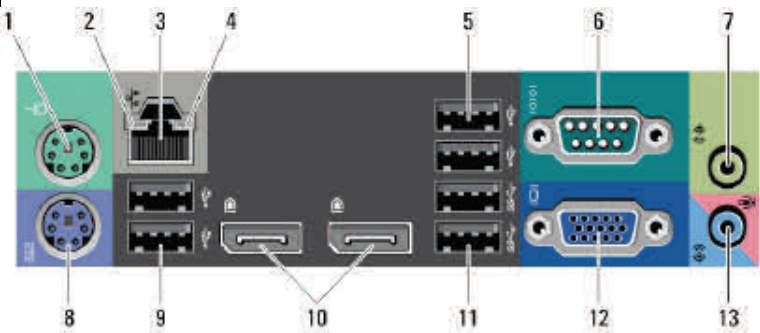
EXTERNAL CHASSIS VIEWS



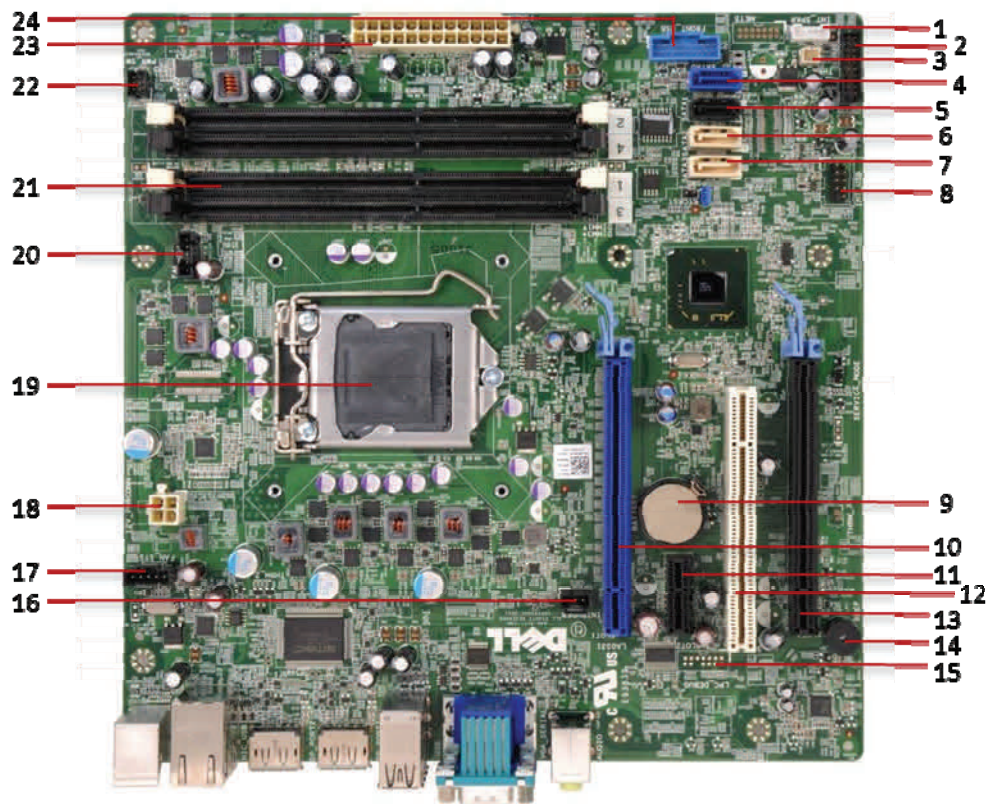
FRONT VIEW			
1	power button, power light	6	USB 2.0 connectors (2)
2	optical drive bay (optional)	7	Drive activity light
3	headphone connector	8	optical drive bay (optional)
4	microphone connector	9	optical drive bay eject button
5	USB 3.0 connectors (2)		

BACK VIEW			
10	power supply diagnostic light	15	security-cable slot
11	power supply diagnostic button	16	padlock ring
12	power connector		
13	back panel connectors		
14	expansion card slots (4)		

BACK PANEL CONNECTORS			
1	PS2/mouse connector	8	PS/2 keyboard connector
2	network link Integrity light	9	USB 2.0 connectors (2)
3	network connector	10	DisplayPort connectors (2)
4	network activity light	11	USB 3.0 connector (2)
5	USB 2.0 connectors (2)	12	VGA connector
6	serial connector	13	Line-in/microphone connector
7	line-out connector		



MOTHERBOARD LAYOUT



MT System Board Components

Number	Name	Number	Name
1	Internal Speaker Connector (INT_SPKR)	13	PCI-e 4x Connector(SLOT4)
2	Front IO Connector (FRONTPANEL)	14	Buzzer (BEEP)
3	Thermal Sensor Connector(THRM_2)	15	LPC Debug Connector (LPC_DEBUG)
4	SATA 0 Connector(SATA0)- SATA III	16	Intrusion Switch Connector (INTRUDER)
5	SATA 1 Connector(SATA1)- SATA III	17	System Fan Connector (FAN_HDD)
6	SATA 2 Connector(SATA2)- SATA II	18	P2 Power Connector(12V_PWRCONN)
7	SATA 3 Connector(SATA3)- SATA II	19	Processor Socket (N/A)
8	Internal USB Connector (INT_USB)	20	CPU fan Connector (FAN_CPU)
9	Battery Connector (BATTERY)	21	Memory Connectors(DIMM1, DIMM2, DIMM3, DIMM4)
10	PCI-e 16x Connector(SLOT1)	22	Power Switch Connector (PWR_SW)
11	PCI-e 1x Connector(SLOT2)	23	P1 Power Connector (POWER)
12	PCI Connector(SLOT3)	24	Front USB3.0 Connector (Front _USB)

MARKETING SYSTEM CONFIGURATIONS

NOTE: Offerings may vary by country. For more information regarding the configuration of your computer, click **Start>Help and Support** and select the option to view information about your computer.

OPERATING SYSTEM

Windows 7® operating system—	Factory Installed Microsoft® Windows 7® Professional (32 and 64 bit) Microsoft® Windows 7® Ultimate (32 and 64 bit)
Windows XP® operating system	Driver availability only via Dell.com Microsoft® Windows XP® Professional (32 and 64 bit)
Red Hat Enterprise Linux	RHEL workstation 6.2 Factory installed RHEL 5.8 supported
Other	FreeDOS drop in the box for (N-series), Ubuntu® Linux version 11.10 (factory installed in China only)

CHIPSET

Chipset	Intel C216 Chipset
Non-volatile memory on chipset	
BIOS Configuration SPI (Serial Peripheral Interface)	64Mbit (8MB) & 32Mbit (4MB)
TPM 1.2 Security Device (Trusted Platform Module) ¹	4KB
Non-TPM	Available in select countries
NIC EEPROM	LOM configuration contained within SPI_FLASH – no dedicated LOM EEPROM

PROCESSOR

NOTE: Global Standard Products (GSP) are a subset of Dell's relationship products that are managed for availability and synchronized transitions on a worldwide basis. They ensure the same platform is available for purchase globally. This allows customers to reduce the number of configurations managed on a worldwide basis, thereby reducing their costs. They also enable companies to implement global IT standards by locking in specific product configurations worldwide. The following GSP processors identified below will be made available to Dell customers.

NOTE: Processor numbers are not a measure of performance. Processor availability subject to change and may vary by region/country.

NOTE: Intel Core i5/i7 processors can only be paired with Non-ECC memory.

		Integrated Graphics Support
Intel® Xeon Four Core Processors		
Intel® Xeon E3-1290 v2 3.70GHz, 8M, 87W, HT, Turbo VT-x, VT-d, TXT (vPro™)	X	None
Intel® Xeon E3-1280 v2 3.60GHz, 8M, 69W, HT, Turbo VT-x, VT-d, TXT (vPro™)	X	None
Intel® Xeon E3-1270 v2 3.50GHz, 8M, 69W, HT, Turbo VT-x, VT-d, TXT (vPro™)	X	None
Intel® Xeon E3-1240 v2 3.40GHz, 8M, 69W, HT, Turbo VT-x, VT-d, TXT (vPro™)	X—GSP	None
Intel® Xeon E3-1225 v2 3.30GHz, 8M, 77W, Turbo VT-x, VT-d, TXT (vPro™)	X	Intel HD P4000 Graphics
Intel® Xeon E3-1220 v2 3.10GHz, 8M, 69W, Turbo VT-x, VT-d, TXT (vPro™)	X—GSP	None
Intel® Core Four Core Processors		
Intel® Core i7-3770 3.40GHz, 8M, 77W, Turbo VT-x, VT-d, TXT (vPro™)	X—GSP	Intel HD 4000 Graphics
Intel® Core i5-3550 3.30GHz, 6M, 77W, Turbo VT-x, VT-d, TXT (vPro™)	X—GSP	Intel HD 2500 Graphics
Intel® Core i5-3470* 3.20GHz, 6M, 77W, Turbo VT-x, VT-d, TXT (vPro™)	X—GSP	Intel HD 2500 Graphics
Intel® Core Two Core Processors		
Intel® Core i3-2130 3.4GHz, 3M, 65W, HT VT-x	X	Intel HD 2000 Graphics
Intel® Core i3-2120 3.30GHz, 3M, 65W, HT VT-x	X	Intel HD 2000 Graphics

MEMORY

NOTE: The Dell Precision T1650 has a dual channel memory bus architecture. Dell recommends that two memory channels be populated with DIMMS for maximum memory performance. Please note, UDIMM ECC and NECC memory cannot be mixed.

NOTE: Maximum memory speed is tied to processor. 1600 MHz memory will run at a reduced speed of 1333 MHz when paired with the Intel® Core i3-2120 or Intel® Core i3-2130 processors.

Type:	DDR3 Synch DRAM Non-ECC and ECC
Max Frequency	1600 MHz
DIMM Slots	4
DIMM Capacities	Up to 8GB
Minimum Memory	2GB
Maximum System Memory	32GB
Memory configurations	
ECC UDIMM Memory	
32GB (4 x 8 GB) DDR3, 1600 MHz	X
16GB (4 x 4 GB) DDR3, 1600 MHz	X
8GB (2 x 4 GB) DDR3, 1600 MHz	X
8GB (4 x 2 GB) DDR3, 1600 MHz	X
8GB (4 x 2 GB) DDR3, 1333 MHz	X
4GB ¹ (2 x 2 GB) DDR3, 1600 MHz,	X
4GB ¹ (2 x 2 GB) DDR3, 1333 MHz,	X
Non- ECC Memory (NECC)	
16GB (4 x 4GB) DDR3, 1600 MHz	X
8GB (2 x 4 GB) DDR3, 1600 MHz	X
8GB (4 x 2 GB) DDR3, 1600 MHz	X
4GB ¹ (2 x 2 GB) DDR3, 1600 MHz,	X
2GB (1 x 2 GB) DDR3, 1600 MHz,	X

¹The total amount of available memory will be less than 4GB on systems running 32-bit operating systems. The amount less depends on the actual system configuration. To fully utilize 4GB or more of memory requires a 64-bit operating system.

GRAPHICS/VIDEO CONTROLLER

NOTE: System supports full height (FH) cards unless specified

NOTE: Dual Graphic options available on NVIDIA NVS 300

Optional Graphic/Video Options		Included Dongle
Mid-range 3D		
1.0GB NVIDIA Quadro 2000 with (2) DP and (1) DVI		(1) DP-DVI, (1) DVI-VGA
Entry 3D		
1.0GB NVIDIA Quadro 600 with (1) DP and (1) DVI		(1) DP-DVI, (1) DVI-VGA
1.0GB AMD FirePro V4900 with (2) DP and (1) DVI		1) DP-DVI, (1) DVI-VGA
Professional 2D		
512MB NVIDIA NVS 300 with (1) DMS-59		(1) DMS-59-Dual DVI
512MB AMD FirePro 2270 with (1) DMS-59		(1) DMS-59-Dual DVI
Integrated Graphic*		
Integrated Intel® HD Graphics P4000 with (2) DP + (1) VGA		None included
Integrated Intel® HD Graphics 4000 with (2) DP + (1) VGA		None included
Integrated Intel® HD Graphics 2500 with (2) DP + (1) VGA		None included
Integrated Intel® HD Graphics 2000 with (1) DP + (1) VGA		None included

*NOTE: Intel Integrated Graphics is only available on select processors. The specific processor determines which type of integrated graphics is available..

DRIVES AND REMOVABLE STORAGE

Bays:	
5.25-inch Optical Bay Supported (External)	2
Optical Drives Supported (maximum)	2
Hard Drive Bay Supported (Internal)	4 (2x 3.5" or 4x 2.5")
Hard Drives Supported 3.5"/2.5" (maximum)	2/4
Interface:	
SATA 2.0 (optical)	2
SATA 3.0	2
3.5" Hard Drives:	
2TB ¹ SATA 7200 RPM HDD	X
1TB ¹ SATA 7200 RPM HDD	X
500GB ¹ SATA 7200 RPM HDD	X
250GB ¹ SATA 7200 RPM HDD	X
2.5" Hard Drives:	
256GB ¹ SATA Solid State Drive	X
500GB ¹ SATA 7200 RPM HDD	X
320GB ¹ OPAL SED with FIPS SATA 7200 RPM HDD	X
32GB ¹ mSATA SSD ²	X-Part of Intel Smart Response Technology

¹ For hard drives, GB means 1 billion bytes; actual capacity varies with preloaded material and operating environment and will be less.

² Please note that the 32GB mSATA is part of the Intel Smart Response Technology (SRT) and must be purchased with additional Hard Drive(s). The mSATA SSD is installed in a 2.5" carrier.

DRIVES AND REMOVABLE STORAGE (CON'T)

Optical Drive:	
5.25" Blu-ray Writer SATA 1.5Gbit/s	X
5.25" DVD+/-RW ¹ SATA 1.5Gbit/s	X
5.25" DVD-ROM ² SATA 1.5Gbit/s	X
Slimline Blu-ray Writer SATA 1.5Gbit/s	X
Slimline DVD+/-RW ¹ SATA 1.5Gbit/s	X
Slimline DVD-ROM ² SATA 1.5Gbit/s	X
Media Card Reader:	
Dell 19 in 1 Media Card Reader	X

¹ Discs burned with this drive may not be compatible with some existing drives and players; using DVD+R media provides maximum compatibility.

² DVD-ROM drives may have write-capable hardware that has been disabled via firmware modifications.

NOTE: Dell 19 in 1 Media Card Reader (MCR) is supported via a F5 to F3 bay converter in the 5.25" Optical Drive Bay.

NOTE: Slimline Optical drives can only be configured when a Memory Card Reader is configured.

SYSTEM EXPANSION SLOTS

NOTE: See Detailed Engineering Specifications for supported voltage, maximum wattage and card dimensions.

PCIe x16 Slot Gen 3	1
PCIe x16 (wired x4) Slot Gen 2	1
PCIe x1 Slot Gen 2	1
PCI 32/33 Slot	1
Serial ATA (SATA) connectors	4

EXTERNAL PORTS/CONNECTORS

NOTE: See chassis diagrams section for port/connector locations

USB 3.0	2 Front, 2 Rear
USB 2.0	2 Front, 4 Rear, 2 Internal
Serial	1 Rear (2nd via optional Add in Card)
Network Connector (RJ-45)	1 Rear
PS/2	2 Rear
1394 Controller via optional PCI card	Optional via Add in Card
Parallel	Optional via Parallel / Serial Add in Card

EXTERNAL PORTS/CONNECTORS (CONT.)

NOTE: See chassis diagrams section for port/connector locations

Audio:	
Line in for microphone	1 Front
Line in for microphone or stereo	1 Rear
Line out for headphones or speakers	1 Front, 1 Rear

HARD DRIVE CONTROLLER

Intel Rapid Storage Controller 11.0 supporting SATA 6Gb/s (2 ports– SATA0, SATA1), host based RAID 0/1/5/10	Integrated
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COMMUNICATIONS - NETWORK ADAPTER (NIC)

Intel® 82579 Gigabit Ethernet LAN 10/100/1000 ¹	Integrated on system board
Broadcom NetXtreme 10/100/1000 PCIe Gigabit ¹ Networking Card	Optional card

¹ This term does not connote an actual operating speed of 1 Gb/sec. For high speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

AUDIO AND SPEAKERS

Realtek ALC269Q High Definition Audio Codec	Integrated on system board
Internal Chassis Speaker	Optional
Dell AX210 2.0 Desktop Speakers	Optional
Dell AX510/AX510PA Flat Panel Soundbar Speakers	Optional

KEYBOARD AND MOUSE

Dell USB Entry Keyboard	Optional
Dell Multimedia Pro Keyboard	Optional
Dell Smartcard Keyboard	Optional
Dell USB Optical Mouse	Optional
Dell Laser Mouse	Optional

SECURITY

Trusted Platform Module (TPM) 1.2 ¹	Integrated on system board
Chassis Intrusion Switch	Optional
Dell Smartcard Keyboard	Optional
Chassis lock slot and loop support	Standard
Dell Data Protection Encryption Accelerator Card	Optional

¹TPM is not available in all countries. Depending on your country regulations, no-TPM system boards may be available.

SERVICE AND SUPPORT

NOTE: For more details on Dell Service Plans please to go to: www.dell.com/service/service_plans

1 Year Warranty ¹ Next Business Day On-site ² (3-3-3)	Standard
ProSupport	Optional

¹ For a copy of our guarantees or limited warranties, please write Dell USA L.P., Attn: Warranties, One Dell Way, Round Rock, TX 78682. For more information, visit www.dell.com/warranty.

² Service may be provided by third-party. Technician will be dispatched if necessary following phone-based troubleshooting. Subject to parts availability, geographical restrictions and terms of service contract. Service timing dependent upon time of day call placed to Dell. U.S. only.

SOFTWARE

Dell Data Protection Access (DDPA)	Standard
Dell Data Protection Encryption (DDPE)	Optional

DETAILED ENGINEERING SPECIFICATIONS

SYSTEM DIMENSIONS (PHYSICAL)

NOTE: System Weight and Shipping Weight is based on a typical configuration and may vary based on PC configuration. A typical configuration includes: one graphics card one hard drive, one optical drive.

Chassis Volume (liters)	27.4 l
Chassis Weight (pounds/kilograms)	20.37 lbs / 9.24 kg
Chassis Dimensions: (HxWxD)	
Height (inches/centimeters)	14.17 in. / 36.0 cm
Width (inches/centimeters)	6.89 in. / 17.5 cm
Depth (inches/centimeters)	17.13 in. / 43.5 cm
Shipping Weight (pounds/kilograms - includes packaging materials)	26.2 lbs / 11.88 kg
Packaging Parameters (HxWxD)	
Height (inches/centimeters)	22.44 in. / 57 cm
Width (inches/centimeters)	18.75 in. / 47.6 cm
Depth (inches/centimeters)	14.09 in. / 35.8 cm

SYSTEM EXPANSION SLOTS

	Type	Voltage supported	Max Height (in,cm)	Max Length (in, cm)	Max Watt-age	Cards supported
1	PCIe x16 Gen3	3.3V/12V	Standard Height 4.38 in / 11.13 cm	Half Length 6.6 in / 16.77 cm	75*	Graphics, Gigabit NIC, Parallel / Serial
2	PCIe x1	3.3V/12V	Standard Height 4.38 in / 11.13 cm	Half Length 6.6 in / 16.77 cm	25	Gigabit NIC, Parallel / Serial
3	PCI	3.3V/5V/12V/-12V	Standard Height 4.38 in / 11.13 cm	Half Length 6.6 in / 16.77 cm	25	1394
4	PCIe x16 (x 4) Gen2	3.3V/12V	Standard Height 4.38 in / 11.13 cm	Half Length 6.6 in / 16.77 cm	75*	Graphics, Gigabit NIC, Parallel / Serial

*Please note that total power consumption for both Slot 1 + Slot 4 <= 100W.

NOTE: Slot 1 is default for factory installed graphics card.

SYSTEM LEVEL ENVIRONMENTAL AND OPERATING CONDITIONS

Temperature	
Operating	10° to 35° C (50° to 95° F)
Non-Operating (Storage)	-40° to 60° C (-40° to 140° F)
Relative Humidity	20% to 80% (non-condensing)
Maximum vibration	
Operating	0.25 G at 3 to 200 Hz at 0.5 octave/min
Non-Operating	0.5 G at 3 to 200 Hz at 1 octave/min
Maximum Shock	
Operating	Bottom half-sine pulse with a change in velocity of 50.8 cm/sec (20 inches/sec)
Non-Operating	27-G faired square wave with a velocity change of 508 cm/sec (200 inches/sec)
Maximum Altitude	
Operating	-15.2 to 3048 m (-50 to 10,000 ft)
Non-Operating	-15.2 to 10,668 m (-50 to 35,000 ft)

POWER

NOTE: These form factors utilize a more efficient Active Power Factor Correction (APFC) power supply. Dell recommends only Universal Power Supplies (UPS) based on Sine Wave output for APFC PSUs, not an approximation of a Sine Wave, Square Wave, or quasi-Square Wave. If you have questions, please contact the manufacture to confirm the output type.

	Entry	Upsell
Power Supply Wattage	275W	320W
AC input Voltage Range	90 – 264Vac	90 – 264Vac
AC input current (low ac range/high AC range)	5.0A / 2.5A	5.0A / 2.5A
AC input Frequency	47Hz / 63Hz	47Hz / 63Hz
AC holdup time (80% load)	16 MSEC	16 MSEC
Average Efficiency (ENERGY STAR 5.2 qualified)		87 – 90 – 87% @ 20 – 50 – 100% load
Typical Efficiency (Active PFC)	65%	

POWER (CONT)

	Entry	Upsell
DC parameters		
+12.0v output	12VA,17.0A; 12VB, 10.0A	12VA,17.0A; 12VB, 1030A
+5.0v auxiliary output	4.0A	4.0A
-12.0v output	0.5A	0.5A
Max total power	275W	320W
BTUs/h (based on PSU max wattage)	938BTU	1093 BTU
Power Supply Fan	80*25mm	80*25mm
Compliance:		
1watt requirement	Yes	Yes
80Plus Compliant	No	Yes—GOLD
FEMP (CECP) Standby Power Compliant	Yes	Yes

3.0V CMOS BATTERY

Brand	Type	Voltage	Composition	Life
PANASONIC	CR-2302L/BE	3V	Lithium	Continuous Discharge Under 15 k Ω Load to 2.5V End-Voltage: 1100 hours or longer
MITSUBISHI	CR2302	3V	Lithium Manganese Dioxide	Continuous Discharge Under 15 k Ω Load to 2.5V End-Voltage: 1000 hours or longer

AUDIO—INTEGRATED**REALTEK ALC269 HIGH DEFINITION AUDIO**

REALTEK ALC269 HIGH DEFINITION AUDIO	
High Definition Stereo support	X
Number of channels	2
Number of Bits / Audio resolution	16, 20, and 24-bit resolution
Sampling rate (recording/playback)	Support 44.1K/48K/96K/192 kHz sample rates
Signal to Noise Ratio	98 dB DAC outputs, 90 dB for ADC inputs
Analog Audio	X
Dolby Digital	
THX	
Digital out (S/PDIF)	
Audio Jack Impedance	
Microphone	40K ohm~60K ohm
Line-In	40K ohm~60K ohm
Line-Out	100~150 ohm
Headphone	1~4 ohm
Internal Speaker Power Rating	2Watt (peak) / 1Watt (average)

COMMUNICATIONS—INTEGRATED LAN**INTEL® 82579 GIGABIT ETHERNET LAN 10/100/1000¹**

INTEL® 82579 GIGABIT ETHERNET LAN 10/100/1000¹	
External Connector Type	RJ45
Data Rates supported	10/100/1000 Mbps
Controller Details	
Controller bus architecture	PCIe-based interface for S0 state, SMBus for Sx low power state
Integrated memory	N/A
Data transfer mode (example Bus-Master DMA)	N/A
Power consumption (full operation per data rate connection speed)	711mW (Max.)
Power consumption (standby operation)	227mW (Max.)
IEEE standards compliance (example 802.1P)	802.3
Hardware Certifications (example FCC, B, GS mark...)	N/A
Boot ROM Support	EEPROM (located in SPI)
Network Transfer Mode (example Full Duplex, Half Duplex)	
Network Transfer Rate (example 10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps)	10 Mb (full/half-duplex) 100 Mb (full/half-duplex) 1000 Mb (full-duplex)

¹ This term does not connote an actual operating speed of 1 Gb/sec. For high speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

COMMUNICATIONS—INTEGRATED LAN (CONT.)

INTEL® 82579 GIGABIT ETHERNET LAN 10/100/1000¹ (CONT.)

Environmental	
Operating temperature	0° C to 85° C (32° F to 185° F)
Operating humidity	20% to 80% (non-condensing)
Operating System Driver Support	Windows 7 32/64, Vista 32/64
Manageability (examples WOL, PXE)	WOL, PXE 2.1
Management Capabilities Alerting	Intel® Standard Manageability, Intel Xeon Processor with vPro Technology

COMMUNICATIONS—ADD IN NETWORK INTERFACE CARD (NIC)

Broadcom NetXtreme 10/100/1000 PCIe Gigabit¹ Networking Card

Connector Type	RJ45
Data Rates supported	10/100/1000 Mbps Half/Full duplex
Controller Details	
Controller bus architecture (example PCIe 1.0a x1)	PCIe c1.0a x1
Integrated memory	64KBytes RX, 8KBytes TX
Data transfer mode (example Bus-Master DMA)	Bus-Master DMA
Power consumption (full operation per data rate connection speed)	2.84W (860mA @ +3.3V)
Power consumption (standby operation)	Less than 300mW
IEEE standards compliance (example 802.1P)	802.3, 802.2, 802.3x, 802.1p
Hardware Certifications (example FCC, B, GS mark...)	FCC B, VCCI B, CE
Boot ROM Support	No
Network Transfer Mode (example Full Duplex, Half Duplex)	
Network Transfer Rate (example 10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps	10BASE-T (full-duplex) 20 Mbps Max* 100BASE-TX (half-duplex) 100 Mbps Max* 100BASE-TX (full-duplex) 200 MbpsMax* 1000BASE-T (full-duplex) 2000 Mbps Max* * Depends on the system environment.
Environmental	
Operating temperature	0° C to 55° C (32° F - 131° F)
Operating humidity	5% ~ 85% (non-condensing)
Operating System Driver Support	Windows® 7 32- & 64-bit, Windows Vista® 32- and 64-bit, Linux
Manageability (examples WOL, PXE)	WOL, PXE2.1, ACPI
Management Capabilities Alerting (example ASF 2.0)	None

¹ This term does not connote an actual operating speed of 1 Gb/sec. For high speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

COMMUNICATIONS—ADD IN 1394 CARD

1394 FIREWIRE PCI ADD IN CARD	
Connector Type	PCI 2.3
Controller Details	
Controller bus architecture (example PCIe 1.0a x1)	PCI 2.3
IO Ports	2 External 1394a 6-pin connectors 1 Internal 1394a 10-pin header
Power Consumption	Under 30 mA
Connector	1394a
OS Support	Win XP, Win Vista and Win 7

COMMUNICATIONS—ADD IN SERIAL / PARALLEL PORT CARD

SERIAL / PARALLEL PORT PCIE ADD-IN CARD	
Connector Type	RS-232 and IEEE1284
Data Rates supported	50bps ~115.2Kbps (Serial) &Maximum 1.8MBp(Parallel)
Controller Details	
Controller bus architecture (example PCIe 1.0a x1)	PCI Express one lane (x1)
Driver Support	Microsoft Client XP/Vista/7 (X86/X64) Microsoft Server 2000/2003/2008 (X86/X64) Microsoft Embedded XP Embedded/POS Ready 2009/ Embedded System 2009 Linux Linux 2.4.x/2.6.x DOS DOS
Full height Serial / Parallel add-in card	Optional
Environment	
Operation Temperature	0 to 60°C (32 to 140°F)
Operation Humidity	5 to 95% RH
Storage Temperature	-20 to 85°C (-4 to 185°F)

GRAPHICS/VIDEO CONTROLLER

INTEGRATED INTEL HD P4000 / 4000 GRAPHICS*	
Bus Type (example integrated or PCIe x16)	Integrated
GPU core clock	650 MHz
Frame Buffer Memory (onboard and shared) Size and Speed	Dynamically shared system memory
Maximum power consumption	N/A, see processor TDP
Maximum Color Depth	32 bit RGB (True Color)
Maximum Vertical Refresh Rate	75 Hz
Multiple Display Support	Yes
Operating Systems Graphics/ Video API Support	Microsoft Windows 7, Vista, XP all with 32bit and 64Bit. Redhat Linux, Open CL 1.1, Open GL 3.1, DirectX 11
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	DisplayPort Max 2 digital displays at up to 2560 X 1600 @60Hz; VGA Max up to : 1920 x 1200 @ 60Hz
External connectors	(2) DP, (1) VGA
DisplayPort	
Bus Type	DDPC
DisplayPort Audio Support	Yes
VGA	
Bus Type	CRT
CRT Audio Support	No

*Only available on select Intel Xeon processors

GRAPHICS/VIDEO CONTROLLER

INTEGRATED INTEL HD 2000/2500 GRAPHICS*	
Bus Type (example integrated or PCIe x16)	Integrated
GPU core clock	650 MHz (HD 2500) / 850 MHz (HD 2000)
Frame Buffer Memory (onboard and shared) Size and Speed	Dynamically shared system memory
Maximum power consumption	N/A, see processor TDP
Maximum Color Depth	32 bit RGB (True Color)
Maximum Vertical Refresh Rate	75 Hz
Multiple Display Support	Yes
Operating Systems Graphics/ Video API Support	Microsoft Windows 7, Vista, XP all with 32bit and 64Bit. Redhat Linux, Open CL 1.1, Open GL 3.1, DirectX 11
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	DisplayPort Max 2 digital displays at up to 2560 X 1600 @60Hz; VGA up to : 1920 x 1200 @ 60Hz
External connectors	(2) DP, (1) VGA
DisplayPort	
Bus Type	DDPC
DisplayPort Audio Support	Yes
VGA	
Bus Type	CRT
CRT Audio Support	No

*Only available on select Intel Core processors

GRAPHICS/VIDEO CONTROLLER

NVIDIA NVS 300	
Bus Type (example integrated or PCIe x16)	PCIEx16
GPU core clock	520 MHz
Frame Buffer Memory (onboard and shared) Size and Speed	512MB DDR3 @ 790 MHz
Maximum power consumption	17.5W
Maximum Color Depth	24 bit RGB (True Color)
Maximum Vertical Refresh Rate	85Hz analog, 60Hz digital
Multiple Display Support	2
Operating Systems Graphics/ Video API Support	Microsoft Windows 7, Vista, XP all with 32bit and 64Bit. Redhat Linux, Open GL 4.1, DirectX 11
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	DisplayPort Max 2 digital displays at up to 2560 X 1600 @60Hz, Single-link DVI Max: 2 digital displays up to 1920 x 1200 @ 60Hz: VGA Max 2 analog displays up to : 2048 x 1536 @ 85Hz
External connectors	DMS59
DisplayPort Audio Support	Yes
Dimensions of full height card inches/centimeters	Low Profile 2.7" H x 5.7" L Single Slot 68mm H x 145mm L
Environmental Operating Conditions (Non-Condensing):	
Operating Temperature Range	0 °C to 55 °C
Relative Humidity Range	5% to 90% RH
Altitude Range	Not specified

GRAPHICS/VIDEO CONTROLLER

NVIDIA QUADRO 600	
Bus Type (example integrated or PCIe x16)	PCIEx16
GPU core clock	640 MHz
Frame Buffer Memory (onboard and shared) Size and Speed	1 GB DDR3 @ 800 MHz
Maximum power consumption	40W
Maximum Color Depth	30Bit
Maximum Vertical Refresh Rate	85Hz analog, 120Hz digital
Multiple Display Support	2
Operating Systems Graphics/ Video API Support	Microsoft Windows 7, Vista, XP all with 32bit and 64Bit. Redhat Linux, Open GL 4.1, DirectX 11
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	DisplayPort Max 2 digital displays at up to 2560 X 1600 @60Hz, or 1920 X 1200 @120HZ. Dual-link DVI Max: 2 digital displays up to 2560 X 1600 @60HX, or 1920 x 1200 @ 120Hz: VGA Max 2 analog displays up to : 2048 x 1536 @ 85Hz
External connectors	1 Dual-link DVI, 1 DisplayPort
DisplayPort Audio Support	Yes
Dimensions of full height card inches/centimeters	2.731" H x 6.6" L Single slot 69mm H x 168mm L
Environmental Operating Conditions (Non-Condensing):	
Operating Temperature Range	0 °C to 55 °C
Relative Humidity Range	5% to 90% RH
Altitude Range	Not specified

GRAPHICS/VIDEO CONTROLLER

NVIDIA QUADRO 2000	
Bus Type (example integrated or PCIe x16)	PCIEx16
GPU core clock	625 MHz
Frame Buffer Memory (onboard and shared) Size and Speed	1024 MB GDDR5 @1300 MHz
Maximum power consumption	62W
Maximum Color Depth	30Bit
Maximum Vertical Refresh Rate	85Hz analog, 120Hz digital
Multiple Display Support	2
Operating Systems Graphics/ Video API Support	Microsoft Windows 7, Vista, XP all with 32bit and 64Bit support. Red Hat Enterprise Linux, Open GL 4.1, DirectX 11
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	DisplayPort Max 2 digital displays at up to 2560 X 1600 @60Hz, or 1920 X 1200 @120HZ. Dual-link DVI Max: 2 digital displays up to 2560 X 1600 @60HX, or 1920 x 1200 @ 120Hz: VGA Max 2 analog displays up to : 2048 x 1536 @ 85Hz
External connectors	1 Dual-link DVI, 2 DisplayPort
DisplayPort Audio Support	Yes
Dimensions of full height card inches/centimeters	4.376" H x 7" L, Single slot 110mm H x 177.8mm L
Environmental Operating Conditions (Non-Condensing):	
Operating Temperature Range	0 °C to 55 °C
Relative Humidity Range	5% to 90% RH
Altitude Range	Not specified

GRAPHICS/VIDEO CONTROLLER

AMD FIREPRO 2270	
Bus Type (example integrated or PCIe x16)	PCIEx16
GPU core clock	600MHz
Frame Buffer Memory (onboard and shared) Size and Speed	512MB DDR3 @ 600MHz
Maximum power consumption	17W
Maximum Color Depth	32bpp
Maximum Vertical Refresh Rate	120Hz
Multiple Display Support	2
Operating Systems Graphics/ Video API Support	WinXP, Win7, Linux, DX11 OGL4.1
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	1920x1200 60hz analog 2560x1600 60hz
External connectors	DMS59 connector, Two DVI to VGA adapters
DisplayPort Audio Support	NA
Dimensions of full height card inches/centimeters	Low Profile, Half Length
Environmental Operating Conditions (Non-Condensing):	
Operating Temperature Range	0 °C to 55 °C
Relative Humidity Range	5% to 90% RH
Altitude Range	Not specified

GRAPHICS/VIDEO CONTROLLER

AMD FIREPRO V4900	
Bus Type (example integrated or PCIe x16)	PCIEx16
GPU core clock	800 MHz
Frame Buffer Memory (onboard and shared) Size and Speed	1 GB GDDR5 @ 1000 MHz
Maximum power consumption	<75W
Maximum Color Depth	32 bpp
Maximum Vertical Refresh Rate	120 Hz
Multiple Display Support	Up to 6 with DisplayPort 1.2 Multi-streaming Up to 3 without DisplayPort 1.2 multi-streaming
Operating Systems Graphics/ Video API Support	Windows Vista, Windows 7, DX 11, OpenGL 4.2
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	Dual-Link DVI Max: 2560 x 1600/32bpp @ 60Hz DisplayPort Max: 2560 x 1600/32bpp @ 60Hz VGA Max : 1920x1440/32bpp @ 75Hz
External connectors	2 DP, 1 DL DVI, One DisplayPort to DVI (single link passive) adapter
DisplayPort Audio Support	Yes
Dimensions of full height card inches/centimeters	Full Height/Half length
Environmental Operating Conditions (Non-Condensing):	
Operating Temperature Range	0 °C to 55 °C
Relative Humidity Range	5% to 90% RH
Altitude Range	Not specified

HARD DRIVES¹**3.5" 2TB SATA 7200 RPM HDD**

Capacity (bytes)	2,000,398,934,016
Dimensions inches (W x D x H)	Approximately (4.00 x 5.787 x 1.028 inches)
Interface type and Maximum speed	SATA Up to 6Gb/s
Internal buffer size	32 MB NCQ
Rotational Speed	7200 RPM
Logical Blocks	3,907,029,168
Power Source	
Power Consumption (reference only)	Idle 5.0W, Active 10.0W
Spin Up Current (reference only)	5V (1A) ,12V (2A)
Environmental Operating Conditions (Non-Condensing):	
Temperature Range	5 ⁰ C to 60 ⁰ C
Relative Humidity Range	20% to 80% non-condensing
Maximum Wet Bulb Temperature	29 ⁰ C
Altitude Range	-50 ft to 10000 ft
Environmental Non-Operating Conditions (Non-Condensing):	
Temperature Range	-40 ⁰ C to 65 ⁰ C
Relative Humidity Range	10% to 90% non-condensing
Maximum Wet Bulb Temperature	38 ⁰ C
Altitude Range	-50 ft to 35000 ft

¹ For hard drives, GB means 1 billion bytes ; actual capacity varies with preloaded material and operating environment and will be less.

HARD DRIVES¹ (CONT)**3.5" 1TB SATA 7200 RPM HDD**

Capacity (bytes)	1,000,204,886,016
Dimensions inches (W x D x H)	Approximately (4.00 x 5.787 x 1.028 inches)
Interface type and Maximum speed	SATA Up to 6Gb/s
Internal buffer size	32 MB NCQ
Rotational Speed	7200 RPM
Logical Blocks	1,953,525,168
Power Source	
Power Consumption (reference only)	Idle 5.0W, Active 10.0W
Spin Up Current (reference only)	5V (1A) ,12V (2A)
Environmental Operating Conditions (Non-Condensing):	
Temperature Range	5 ⁰ C to 60 ⁰ C
Relative Humidity Range	20% to 80% non-condensing
Maximum Wet Bulb Temperature	29 ⁰ C
Altitude Range	-50 ft to 10000 ft
Environmental Non-Operating Conditions (Non-Condensing):	
Temperature Range	-40 ⁰ C to 65 ⁰ C
Relative Humidity Range	10% to 90% non-condensing
Maximum Wet Bulb Temperature	38 ⁰ C
Altitude Range	-50 ft to 35000 ft

¹ For hard drives, GB means 1 billion bytes ; actual capacity varies with preloaded material and operating environment and will be less.

HARD DRIVES¹ (CONT.)

3.5" 500GB SATA 7200 RPM HDD	
Capacity (bytes)	500,107,862,016
Dimensions inches (W x D x H)	Approximately (4.00 x 5.787 x 1.028 inches)
Interface type and Maximum speed	SATA Up to 6Gb/s
Internal buffer size	16 MB NCQ
Rotational Speed	7200 RPM
Logical Blocks	976,773,168
Power Source	
Power Consumption (reference only)	Idle 5.0W, Active 10.0W
Spin Up Current (reference only)	5V (1A) ,12V (2A)
Environmental Operating Conditions (Non-Condensing):	
Temperature Range	5°C to 60°C
Relative Humidity Range	20% to 80% non-condensing
Maximum Wet Bulb Temperature	29°C
Altitude Range	-50 ft to 10000 ft
Environmental Non-Operating Conditions (Non-Condensing):	
Temperature Range	-40°C to 65°C
Relative Humidity Range	10% to 90% non-condensing
Maximum Wet Bulb Temperature	38°C
Altitude Range	-50 ft to 35000 ft

¹ For hard drives, GB means 1 billion bytes ; actual capacity varies with preloaded material and operating environment and will be less.

HARD DRIVES¹ (CONT.)

3.5" 250GB SATA 7200 RPM HDD	
Capacity (bytes)	250,059,350,016
Dimensions inches (W x D x H)	Approximately (4.00 x 5.787 x 1.028 inches)
Interface type and Maximum speed	SATA Up to 6Gb/s
Internal buffer size	8 MB NCQ
Rotational Speed	7200 RPM
Logical Blocks	488,397,168
Power Source	
Power Consumption (reference only)	Idle 5.0W, Active 10.0W
Spin Up Current (reference only)	5V (1A) ,12V (2A)
Environmental Operating Conditions (Non-Condensing):	
Temperature Range	5°C to 60°C
Relative Humidity Range	20% to 80% non-condensing
Maximum Wet Bulb Temperature	29°C
Altitude Range	-50 ft to 10000 ft
Environmental Non-Operating Conditions (Non-Condensing):	
Temperature Range	-40°C to 65°C
Relative Humidity Range	10% to 90% non-condensing
Maximum Wet Bulb Temperature	38°C
Altitude Range	-50 ft to 35000 ft

¹ For hard drives, GB means 1 billion bytes ; actual capacity varies with preloaded material and operating environment and will be less.

HARD DRIVES¹ (CONT.)**2.5" 256GB SOLID STATE DRIVE (SSD)**

Capacity (bytes)	256GB
Dimensions inches (W x D x H)	Approximately (2.75 x 3.94 x 0.276 inches)
Interface type and Maximum speed	SATA Up to 6Gb/s
Internal buffer size	256 MB
MTBF	1M Hours
Logical Blocks	1,000,215,216 / 500,118,192
Power Source	
Power Consumption (reference only)	Idle 0.50W, Active 2.5W
Spin Up Current (reference only)	NA
Environmental Operating Conditions (Non-Condensing):	
Temperature Range	0°C to 70°C
Relative Humidity Range	10% to 90% non-condensing
Maximum Wet Bulb Temperature	29°C
Altitude Range	Exceeds Platform range
Op Shock (@0.5ms)	1,500G
Environmental Non-Operating Conditions (Non-Condensing):	
Temperature Range	-40°C to 70°C
Relative Humidity Range	5% to 95% non-condensing
Maximum Wet Bulb Temperature	38°C
Altitude Range	Exceeds Platform range

¹ For hard drives, GB means 1 billion bytes ; actual capacity varies with preloaded material and operating environment and will be less.

HARD DRIVES¹ (CONT.)**2.5" 500GB SATA 7200 RPM HDD**

Capacity (bytes)	500,107,862,016
Dimensions inches (W x D x H)	Approximately (2.75 x 3.94 x 0.374 inches)
Interface type and Maximum speed	SATA Up to 3Gb/s
Internal buffer size	16 MB NCQ
Rotational Speed	7200 RPM
Logical Blocks	976,773,168
Power Source	
Power Consumption (reference only)	Idle 0.70W, Active 3.25W
Spin Up Current (reference only)	5V (1000 mA)
Environmental Operating Conditions (Non-Condensing):	
Temperature Range	5°C to 60°C
Relative Humidity Range	20% to 80% non-condensing
Maximum Wet Bulb Temperature	29°C
Altitude Range	-50 ft to 10000 ft
Environmental Non-Operating Conditions (Non-Condensing):	
Temperature Range	-40°C to 65°C
Relative Humidity Range	10% to 90% non-condensing
Maximum Wet Bulb Temperature	38°C
Altitude Range	-50 ft to 35000 ft

¹ For hard drives, GB means 1 billion bytes ; actual capacity varies with preloaded material and operating environment and will be less.

HARD DRIVES¹ (CONT.)**2.5" 320GB OPAL SED WITH FIPS SATA 7200 RPM**

Capacity (bytes)	320,072,933,376
Dimensions inches (W x D x H)	Approximately (2.75 x 3.94 x 0.374 inches)
Interface type and Maximum speed	SATA Up to 3Gb/s
Internal buffer size	16 MB NCQ
Rotational Speed	7200 RPM
Logical Blocks	625,142,448
Power Source	
Power Consumption (reference only)	Idle 0.70W, Active 3.25W
Spin Up Current (reference only)	5V (1000 mA)
Environmental Operating Conditions (Non-Condensing):	
Temperature Range	5°C to 60°C
Relative Humidity Range	20% to 80% non-condensing
Maximum Wet Bulb Temperature	29°C
Altitude Range	-50 ft to 10000 ft
Environmental Non-Operating Conditions (Non-Condensing):	
Temperature Range	-40°C to 65°C
Relative Humidity Range	10% to 90% non-condensing
Maximum Wet Bulb Temperature	38°C
Altitude Range	-50 ft to 35000 ft

¹ For hard drives, GB means 1 billion bytes ; actual capacity varies with preloaded material and operating environment and will be less.

HARD DRIVES¹ (CONT.)

2.5" CARRIER WITH 32GB MSATA SSD*	
Capacity (bytes)	32GB
Dimensions inches (W x D x H)	Approximately (2.75 x 3.94 x 0.374 inches) with Case
Interface type and Maximum speed	SATA Up to 6Gb/s
MTBF	1M Hours
Logical Blocks	62,533,296
Power Source	
Power Consumption (reference only)	Idle 0.50W, Active 2.5W
Spin Up Current (reference only)	N/A
Environmental Operating Conditions (Non-Condensing):	
Temperature Range	0°C to 70°C
Relative Humidity Range	10% to 90% non-condensing
Maximum Wet Bulb Temperature	29°C
Altitude Range	1,500G
Environmental Non-Operating Conditions (Non-Condensing):	
Temperature Range	-40°C to 70°C
Relative Humidity Range	5% to 95% non-condensing
Maximum Wet Bulb Temperature	38°C
Altitude Range	-50 ft to 35000 ft

¹ For hard drives, GB means 1 billion bytes ; actual capacity varies with preloaded material and operating environment and will be less.

* Please note that the 32GB mSATA SSD is part of the Intel Smart Response Technology (SRT) and must be purchased with additional Hard Drive(s). The mSATA SSD is installed in a 2.5" carrier.

OPTICAL DRIVES

	8x Slimline DVD-ROM	8x Slimline DVD +/- R/W ¹	6x Slimline BD-RE
External Dimensions inches/ centimeters (Without Bezel – W x H x D)	128.0 mm (5.04)/ 12.7mm (0.5 in)/ 126.1mm (4.97in)	128.0 mm (5.04)/ 12.7mm (0.5 in)/ 126.1mm (4.97in)	128.0 mm (5.04)/ 12.7mm (0.5 in)/ 126.1mm (4.97in)
Weight (max) pounds/kilograms	170g	170g	170g
Interface type and speed	SATA 1.5Gbit/s	SATA 1.5Gbit/s	SATA 1.5Gbit/s
Disc Capacity	Standard	Standard	Standard
Internal buffer size	supplier dependent	supplier dependent	supplier dependent
Access Times (typical)	supplier dependent	supplier dependent	supplier dependent
Maximum Data Transfer Rates			
Writes	NA	8x DVD/ 24x CD	6xBD/ 8x DVD/ 24x CD
Reads	8x DVD/ 24x CD	8x DVD/ 24x CD	6xBD/ 8x DVD/ 24x CD
Power Source			
DC Power Requirements	5V	5V	5V
DC Current	1000mA	1000mA	1000mA
Environmental Operating Conditions (Non-Condensing):			
Operating Temperature Range	5C to 50C	5C to 50C	5C to 50C
Relative Humidity Range	20% to 80% RH	20% to 80% RH	20% to 80% RH
Maximum Wet Bulb Temperature	29C	29C	29C
Altitude Range	-200 to 3048	-200 to 3048	-200 to 3048
Environmental Non-Operating Conditions (Non-Condensing):			
Operating Temperature Range	-40C to 65C	-40C to 65C	-40C to 65C
Relative Humidity Range	5% to 95% RH	5% to 95% RH	5% to 95% RH
Maximum Wet Bulb Temperature	38C	38C	38C
Altitude Range	-200 to 10600m	-200 to 10600m	-200 to 10600m

¹ Discs burned with this drive may not be compatible with some existing drives and players; using DVD+R media provides maximum compatibility.

OPTICAL DRIVES (CONTINUED)

	16x Half Height DVD-ROM	16x Half Height DVD +/- R/W ¹	8 Half Height BD-RE
External Dimensions inches/ centimeters (Without Bezel – W x H x D)	148.2mm(6in)/42mm (2in)/ 171 (max)	148.2mm(6in)/42mm (2in)/ 171 (max)	148.2mm(6in)/42mm (2in)/ 190.5 (max)
Weight (max) pounds/kilograms	800g	800g	800g
Interface type and speed	SATA 1.5Gbit/s	SATA 1.5Gbit/s	SATA 1.5Gbit/s
Disc Capacity	Standard	Standard	Standard
Internal buffer size	supplier dependent	supplier dependent	supplier dependent
Access Times (typical)	supplier dependent	supplier dependent	supplier dependent
Maximum Data Transfer Rates			
Writes	NA	16x DVD/48x CD	8xBD/16x DVD/40x CD
Reads	16x DVD/48x CD	16x DVD/48x CD	8xBD/16x DVD/40x CD
Power Source			
DC Power Requirements	12V, 5V	12V, 5V	12V, 5V
DC Current	800mA (12V)/ 1100mA (5V)	800mA (12V)/ 1100mA (5V)	800mA (12V)/ 1100mA (5V)
Environmental Operating Conditions (Non-Condensing):			
Operating Temperature Range	5C to 50C	5C to 50C	5C to 50C
Relative Humidity Range	20% to 80% RH	20% to 80% RH	20% to 80% RH
Maximum Wet Bulb Temperature	29C	29C	29C
Altitude Range	-200 to 3048	-200 to 3048	-200 to 3048
Environmental Non-Operating Conditions (Non-Condensing):			
Operating Temperature Range	-40C to 65C	-40C to 65C	-40C to 65C
Relative Humidity Range	5% to 95% RH	5% to 95% RH	5% to 95% RH
Maximum Wet Bulb Temperature	38C	38C	38C
Altitude Range	-200 to 10600m	-200 to 10600m	-200 to 10600m

¹ Discs burned with this drive may not be compatible with some existing drives and players; using DVD+R media provides maximum compatibility.

MEDIA CARD READER (MCR)

NOTE: Dell 19 in 1 Media Card Reader (MCR) is supported via an optional bracket. MCR is not available when a second optical drive is installed.

19 IN 1 MEDIA CARD READER	
External Dimensions inches/(centimeters) (With Bezel – W x H)	3.99/(10.13cm)/1.0/(2.54cm)
Weight (max) pounds/kilograms	~155g
Interface type and speed	USB 2.0, 480Mb/s
Media Supported (maximum capacity supported will vary by Flash Media Types)	
Media Supported	CF I CF II Micro Drive (MD) Secure Digital (SD) SDHC Mini Secure Digital (mini-SD) Micro Secure Digital (Micro-SD)(with adapter) Multi Media Card (MMC) RS Multi Media Card (RS-MMC) Multi Media Card plus (MMC plus) RS Multi Media Card plus (RS-MMC plus) Multi Media Card Micro(MMC Micro) (with adapter) Memory Stick (MS) Memory Stick Pro(MS Pro) Memory Stick Pro Duo (MS Pro Duo) Memory Stick Duo (MS-Duo) Memory Stick Micro(MS Micro)(M2) (with adapter) Smart Media (SM) xD
Support Specification Versions:	Compact Flash type I/II Version 4.0 Smart Media (SM) Specification 2003 Multi Media Card (MMC) Specification 4.2 Secure Digital (SD) 2.0 Memory Stick Pro (MS-PRO) Specification 1.02 Memory Stick (MS) Specification 1.43 xD Specification 1.2
Power Source	
Max Power Requirements	12V, 5V
Supply Voltage Range	4.75V ~ 5.25V
Power Consumption:	Standby less than 0.5mA @ 5.0VDC
Environmental Operating Conditions (Non-Condensing):	
Operating Temperature Range	5C to 50C
Relative Humidity Range	10% to 90% RH
Environmental Non-Operating Conditions (Non-Condensing):	
Operating Temperature Range	-40C to 65C
Relative Humidity Range	5% to 95% RH

System Configuration	Integrated NIC:	Enable w/PXE
	Serial Port:	COM1
	SATA Operation:	RAID On
	Drives:	Enable (SATA-0, SATA-1, SATA-2, SATA-3)
	SMART Reporting:	Disable
	USB Configuration:	Enable (Boot Support, Front USB Ports, Rear Dual USB Ports, Rear Quad USB Ports)
	Miscellaneous Devices:	Enable (PCI Slot)
Video	Multi-display:	Disable (For system with discrete graphics)
Security	Strong Password:	Disable
	Password Configuration:	4~32
	Password Bypass:	Disable
	Password Changes:	Enable
	TPM Security:	Disable
	Computrace®:	Deactivate
	CPU XD Support:	Enable
	OROM Keyboard Access	Enable
	Admin Setup Lockout	Disable
	Chassis Intrusion	Disable (For system with Chassis Intrusion detection)
Performance	Multiple Core Support:	All
	Intel® SpeedStep™:	Enable
	C States Control:	Enable
	Intel TurboBoost	Enable
	HyperThread control:	Enable
Power Management	AC Recovery:	Power Off
	Auto On Time:	Disable
	Deep Sleep Control:	Disable
	Fan Control Override:	Disable
	USB Wake Support	Disable
	Wake on LAN:	Disable
	Block sleep	Disable
POST Behavior	Numlock LED:	Enable
	Keyboard Errors:	Enable
	POST HotKeys:	Enable
Virtualization Support	Virtualization:	Enable
	VT for Direct I/O:	Enable
	Trusted Direct I/O	Disable
Maintenance	Service Tag:	Set by the factory
	Asset Tag:	Optional User Entry
	SERR Message:	Enable

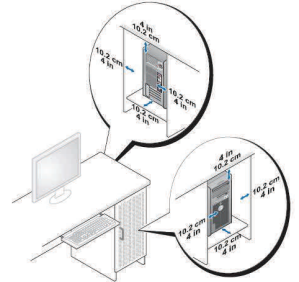
CHASSIS ENCLOSURE & VENTILATION REQUIREMENTS

ENCLOSURE VENTILATION

If your enclosure has doors, they need to be of a type that allows at least 30% airflow through the enclosure (front and back).

ENCLOSURE MINIMUM CLEARANCE

Leave a 10.2 cm (4 in.) minimum clearance on all vented sides of the computer to permit the airflow required for proper ventilation.



ENCLOSURE DOOR AREA

The intake and exhaust door areas should be, at a minimum, the same size as the system intake and exhaust areas.

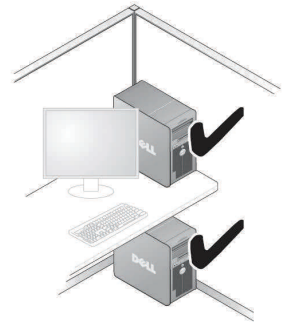
RECOMMENDED ENCLOSURE

Do not install your computer in an enclosure that does not allow airflow. This restricts the airflow and impacts your computer's performance, possibly causing it to overheat.



OPEN DESK MINIMUM CLEARANCE

If your computer is installed in a corner, on a desk, or under a desk, leave at least 5.1 cm (2 in.) clearance from the back of the computer to the wall to permit the airflow required for proper ventilation.



REGULATORY COMPLIANCE AND ENVIRONMENTAL

Product related conformity assessment and regulatory authorizations including Product Safety, Electromagnetic Compatibility (EMC), Ergonomics, and Communication Devices relevant to this product may be viewed at www.dell.com/regulatory_compliance. The Regulatory Datasheet for this product is located at http://www.dell.com/regulatory_compliance.

Details of Dell's environmental stewardship program to conserve product energy consumption, reduce or eliminate materials for disposal, prolong product life span and provide effective and convenient equipment recovery solutions may be viewed at www.dell.com/environment. Product related conformity assessment, regulatory authorizations, and information encompassing Environmental, Energy Consumption, Noise Emissions, Product Materials Information, Packaging, Batteries, and Recycling relevant to this product may be viewed by clicking the Design for Environment link on the webpage.



Date: December 14, 2011

Subject: Statement of Volatility – Dell Precision T1650

To whom it may concern:

The Dell Precision T1650 contains both “volatile” and “non-volatile” (NV) components. Volatile components lose their data immediately upon removal of power from the component. Non-volatile components continue to retain their data even after the power has been removed from the component. The following volatile and NV components are present on the Dell Precision T1650 motherboard:

Description	Reference Designator	Volatility Description	User Accessible for external data	Remedial Action (action necessary to lose data)
Embedded Flash memory in embedded controller SMSC5545	U01	96K bytes non-volatile memory. 2K bytes non-volatile memory for keyboard controller.	No	N/A
System BIOS	SPI_1, SPI_2	Non-volatile memory, 64M bits (8MB), 32Mbits (4MB) System BIOS and Video BIOS for basic boot operation, PSA (on board diags.)	No	N/A
TPM	UF2	4K bytes non-volatile memory located in the TPM module.	No	N/A
System Memory – DDR3 DIMM memory	Connectors : DIMM1, DIMM2, DIMM3, DIMM4	Volatile memory in OFF state (see state definitions later in text) One to four modules will be populated. System memory size will depend on DIMM modules and will be between 1GB to 8GB.	Yes	Power off system.
System memory SPD EEPROM	On memory DIMM(s) – one, two, three, or four present	Non-volatile EEPROM memory. 2K bits (256 bytes). One Device present on each DIMM. Stores memory manufacturer data and timing information for correct operation of system memory.	No	N/A

Description	Reference Designator	Volatility Description	User Accessible for external data	Remedial Action (action necessary to lose data)
RTC CMOS	BATTERY	Volatile battery back-backed CMOS memory 256 bytes. Stores CMOS information.	No	Removing the on board Coin Cell battery.
Video memory – type – see next column	UMA architecture-uses system DDR3.	Volatile memory in off state. UMA uses main system memory size allocated out of main memory.	No	Enter S3-S5 state below.
Hard drive	User replaceable	Non-volatile magnetic media, various sizes in GB.	Yes	Low level format.
<u>CD-ROM/RW/</u> <u>DVD/</u> <u>DVD+RW/</u> <u>Diskette</u> <u>Drives</u>	User replaceable	Non-volatile optical/magnetic media.	Yes	Low level format/erase.

All other components on the motherboard will lose data once power is removed from the system. Primary power loss (Unplug the power cord and remove the battery) will destroy all user data on the memory (DDR3, 1333/1600MHz). Secondary power loss (removing the on board coin cell battery) will destroy system data on the system configuration and time-of-day information.

In addition, to clarify memory volatility and data retention in situations where the system is put in different ACPI power states the following is provided (those ACPI power states are S0, S1, S3, S4 and S5):

S0 state is the working state where the dynamic RAM is maintained and is read/write by the processor.

S1 state is a low wake-up latency sleeping state. In this state, no system context is lost (CPU or chip set) and hardware maintains all system contexts.

S3 is called “suspend to RAM” state or stand-by mode. In this state the dynamic RAM is maintained. Dell systems will be able to go to S3 if the OS and the peripherals used in the system supports S3 state. Linux and Windows 7 support S3 state.

S4 is called “suspend to disk” state or “hibernate” mode. There is no power. In this state, the dynamic RAM is not maintained. If the system has been commanded to enter S4, the OS will write the system context to a non-volatile storage file and leave appropriate context markers. When the system is coming back to the working state, a restore file from the non-volatile storage can occur. The restore file has to be valid. Dell systems will be able to go to S4 if the OS and the peripherals support S4 state. Windows 7 support S4 state.

S5 is the “soft” off state. There is no power. The OS does not save any context to wake up the system. No data will remain in any component on the system board, i.e. cache or memory. The system will require a complete boot when awakened. Since S5 is the shut off state, coming out of S5 requires power on which clears all registers.

The following table shows all the states supported by Dell Precision T1650

Model Number	S0	S1	S3	S4	S5
Dell Precision T1650	X		X	X	X

Please direct any questions to your Dell Marketing contact.

Sincerely,

Dell Marketing